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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/768,246	01/25/2001	Kazushi Higashi	2001_0055	3700

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EXAMINER	
PAREKH, NITIN	

ART UNIT	PAPER NUMBER
2811	

DATE MAILED: 04/22/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	09/768,246	HIGASHI ET AL.	
	Examiner	Art Unit	
	Nitin Parekh	2811	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *17 November 2003*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *12,13 and 21-35* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *12,13 and 21-35* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *25 January 2001* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

Request for Continued Examination

1. A request for continued examination (RCE) under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on 11/17/03 has been entered. An action on the RCE follows.

2. The amendment filed on 11/17/2003 has been entered.

Claim Rejections - 35 USC § 112

3. The following is a quotation of the first paragraph of 35 U.S.C. 112:

> The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

4. Claims 12, 25 and 30 are rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the enablement requirement. The claim(s) contains subject matter which was not described in the specification in such a way as to enable one skilled in the art to which it pertains, or with which it is most nearly connected, to make and/or use the invention.

The claim limitations as recited in lines 11 and 12 of the claims 12, 25 and 30 include: "wherein said wire material portion does not contact the IC electrode or the circuit forming surface".

However, as described in the specification and Figures, the wire material portion (see 43, 53, etc, in Fig. 4, 7, 12, etc. being connected to the electrode 2) is in electrically and metallurgical/structural contact with the IC electrode and respective circuits.

Claim Rejections - 35 USC § 103

5. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

6. Claims 12, 13 and 21-35 are rejected under 35 U.S.C. 103(a) as being unpatentable over DiStefano et al. (US Pat. 5518964) in view of Khandros et al. (US Pat. 5917707).

A. Regarding claim 12, DiStefano et al. disclose a semiconductor arrangement comprising:

- a bump electrode (80/113/104 in Fig. 14-17) having a first protrusion (80 in Fig. 15) and second protrusions (80/111 in Fig. 15) bonded to a wafer/IC chip electrode/pad (90 in Fig. 15) on a circuit forming surface of a semiconductor element
- wherein said first and second protrusions are in contact with or close to an electrode/pad contact on a circuit substrate (86 in Fig. 14-17) when being mounted

on the circuit substrate and are adapted to be directly electrically connected to the semiconductor element is (see Fig. 15-17)

- wherein said first protrusion has a formed/bonded portion and a lead/wire material portion comprising a portion of the lead/wire (see 104 and 66/68/113 respectively in Fig. 15) in a vicinity of the formed/bonded portion, said wire material portion extending from a tip/vertex portion of said formed/bonded portion sideway/downward from the tip/vertex portion and being connected/bonded to the formed/bonded portion
- wherein the lead/wire material portion is in electrical and metallurgical contact with the IC electrode/contact pad on the circuit forming surface, and
- wherein said bump electrode is approximately V-shaped (see 80/104 in Fig. 14 and 15) and a bottom portion of the "V" faces towards the semiconductor element

(Fig. 14-17; Col. 12, line 60- Col. 14, line 3; Col. 7-14).

DiStefano et al. fail to teach the mounting the semiconductor element on a circuit board substrate.

Khandros et al. teach a variety of configurations comprising mounting of IC elements (see 416, 427, etc. in Fig. 25, 26, etc.) on conventional substrates such as printed circuit board/PCB (see 411, 423, etc. in Fig. 25, 26, etc.) to provide the desired multicomponent interconnections.

It would have been obvious to a person of ordinary skill in the art at the time invention was made to incorporate the circuit board substrate as taught by Khandros et al. so that the desired package integration and interconnections can be achieved in DiStefano et al's arrangement.

B. Claim 12 does not distinguish over DiStefano et al. and Khandros et al. regardless of a process for forming the formed portion of the first protrusion by forming the melted portion of wire with a capillary and solidifying the melted portion, because only the final product is relevant, not the process of making such as "melting and solidifying or stamping or pressing". Note that a "product by process" claim is directed to the product per se, no matter how actually made, In re Hirao, 190 USPQ 15 at 17 (footnote 3). See also In re Brown, 173 USPQ 685; In re Luck, 177 USPQ 523; In re Fessmann, 180 USPQ 324; In re Avery, 186 USPQ 161; In re Wertheim, 191 USPQ 90 (209 USPQ 554 does not deal with this issue); and In re Marrosi et al., 218 USPQ 289, all of which make it clear that it is the patentability of the final product per se which must be determined in a "product by process" claim, and not the patentability of the process, and that an old or obvious product produced by a new method is not patentable as a product, whether claimed in "product by process" claims or not. Note that applicant has the burden of proof in such cases, as the above case law makes clear. See also MPEP 706.03(e).

Regarding claim 13, DiStefano et al. and Khandros et al. teach substantially the entire claimed structure as applied to claim 12 above, wherein DiStefano et al. teach the electrode/pad on the substrate and said bump electrode being electrically connected (Fig. 14-17).

Regarding claim 21, DiStefano et al. and Khandros et al. teach substantially the entire claimed structure as applied to claim 12 above, except the first and second protrusions having an amount of conductive adhesive by which the IC electrode of the semiconductor element can be connected to the bump electrode.

Khandros et al. teach further teach the variety of configurations having respective electrode/pad/terminal interconnections being bonded/coupled using a conductive material such as a solder or a conductive epoxy/adhesive (Col. 21, line 47).

It would have been obvious to a person of ordinary skill in the art at the time invention was made to incorporate the first and second protrusions having an amount of conductive adhesive by which the IC electrode of the semiconductor element can be connected to the bump electrode as taught by Khandros et al. so that the desired package integration and interconnections can be achieved in Khandros et al. and DiStefano et al's arrangement.

Regarding claims 22 and 23, DiStefano et al. and Khandros et al. teach substantially the entire claimed structure as applied to claim 12 above, wherein DiStefano et al. teach the vertex portion of the first protrusion and that of the second protrusion having a flat surface portion (see top surfaces of 80/104 and 80/111 in Fig. 15-17) and having a substantially same height (see the height of protruding portions 80 in Fig. 14).

Regarding claim 24, DiStefano et al. and Khandros et al. teach substantially the entire claimed structure as applied to claim 12 above, except the second protrusion being formed from a portion of the wire extending upward from the wire material portion bonded to the formed portion.

Khandros et al. teach further teach the variety of configurations/shapes of the protrusions/bends in the contact structures where the protrusions/bends (see a variety of protrusions/bends in Fig. 3-11) are formed from a portion of the wire extending in upward direction, downward direction or sideways from the wire material portion.

It would have been obvious to a person of ordinary skill in the art at the time invention was made to incorporate the second protrusion being formed from a portion of the wire extending upward from the wire material portion bonded to the formed portion as taught by Khandros et al. so that the desired configuration/shape and bonding strength can be achieved in Khandros et al. and DiStefano et al's arrangement.

Regarding claim 35, DiStefano et al. and Khandros et al. teach substantially the entire claimed structure as applied to claim 12 above, wherein DiStefano et al. teach the first protrusion comprising a first top portion of the 'V' (see 80 in Fig. 15) and a second protrusion comprising a second top portion of the 'V' (see 111 in Fig. 15).

A. Regarding claim 25, DiStefano et al. and Khandros et al. teach substantially the entire claimed structure as applied to claim 12 above, wherein DiStefano et al. further teach the first protrusion and the second protrusion having a substantially a same height (see the height of protruding portions 80 in Fig. 14-17).

B. Claim 25, does not distinguish over DiStefano et al. and Khandros et al. regardless of a process for forming the formed portion of the first protrusion by forming the melted portion of wire with a capillary and solidifying the melted portion, because only the final product is relevant, not the process of making such as "melting and solidifying or stamping or pressing". Note that a "product by process" claim is directed to the product per se, no matter how actually made, In re Hirao, 190 USPQ 15 at 17 (footnote 3). See also In re Brown, 173 USPQ 685; In re Luck, 177 USPQ 523; In re Fessmann, 180 USPQ 324; In re Avery, 186 USPQ 161; In re Wertheim, 191 USPQ 90 (209 USPQ 554 does not deal with this issue); and In re Marrosi et al., 218 USPQ 289, all of which make it clear that it is the patentability of the final product per se which must be determined in a "product by process" claim, and not the patentability of the

process, and that an old or obvious product produced by a new method is not patentable as a product, whether claimed in "product by process" claims or not. Note that applicant has the burden of proof in such cases, as the above case law makes clear. See also MPEP 706.03(e).

Regarding claim 26, DiStefano et al. and Khandros et al. teach substantially the entire claimed structure as applied to claim 25 above, wherein DiStefano et al. teach the electrode/pad on the substrate and the bump electrode being electrically connected (Fig. 14-17).

Regarding claim 27, DiStefano et al. and Khandros et al. teach substantially the entire claimed structure as applied to claim 25 above, except the first and second protrusions having an amount of conductive adhesive by which the IC electrode of the semiconductor element can be connected to the bump electrode.

Khandros et al. teach further teach the variety of configurations having respective electrode/pad/terminal interconnections being bonded/coupled using a conductive material such as a solder or a conductive epoxy/adhesive (Col. 21, line 47).

It would have been obvious to a person of ordinary skill in the art at the time invention was made to incorporate the first and second protrusions having an amount of conductive adhesive by which the IC electrode of the semiconductor element can be connected to the bump electrode as taught by Khandros et al. so that the desired

package integration and interconnections can be achieved in Khandros et al. and DiStefano et al's arrangement.

Regarding claim 28, DiStefano et al. and Khandros et al. teach substantially the entire claimed structure as applied to claim 25 above, wherein DiStefano et al. teach the vertex portion of the first protrusion and that of the second protrusion having a flat surface portion (see top surfaces of 80/104 and 80/111 in Fig. 15-17).

Regarding claim 29, DiStefano et al. and Khandros et al. teach substantially the entire claimed structure as applied to claim 25 above, except the second protrusion being formed from a portion of the wire extending upward from the wire material portion bonded to the formed portion.

Khandros et al. teach further teach the variety of configurations/shapes of the protrusions/bends in the contact structures where the protrusions/bends (see a variety of protrusions/bends in Fig. 3-11) are formed from a portion of the wire extending in upward direction, downward direction or sideways from the wire material portion.

It would have been obvious to a person of ordinary skill in the art at the time invention was made to incorporate the second protrusion being formed from a portion of the wire extending upward from the wire material portion bonded to the formed portion as taught by Khandros et al. so that the desired configuration/shape and bonding strength can be achieved in Khandros et al. and DiStefano et al's arrangement.

A. Regarding claim 30, DiStefano et al. and Khandros et al. teach substantially the entire claimed structure as applied to claim 12 above, wherein DiStefano et al. further teach the first protrusion and the second protrusion having a flat surface portion parallel to the IC chip electrode/pad (see top surfaces of 80/104, 80/111 and 90 in Fig. 15-17).

B. Claim 30 does not distinguish over DiStefano et al. and Khandros et al. regardless of a process for forming the formed portion of the first protrusion by forming the melted portion of wire with a capillary and solidifying the melted portion, because only the final product is relevant, not the process of making such as "melting and solidifying or stamping or pressing". Note that a "product by process" claim is directed to the product per se, no matter how actually made, In re Hirao, 190 USPQ 15 at 17 (footnote 3). See also In re Brown, 173 USPQ 685; In re Luck, 177 USPQ 523; In re Fessmann, 180 USPQ 324; In re Avery, 186 USPQ 161; In re Wertheim, 191 USPQ 90 (209 USPQ 554 does not deal with this issue); and In re Marrosi et al., 218 USPQ 289, all of which make it clear that it is the patentability of the final product per se which must be determined in a "product by process" claim, and not the patentability of the process, and that an old or obvious product produced by a new method is not patentable as a product, whether claimed in "product by process" claims or not. Note that applicant has the burden of proof in such cases, as the above case law makes clear. See also MPEP 706.03(e).

Regarding claim 31, DiStefano et al. and Khandros et al. teach substantially the entire claimed structure as applied to claim 30 above, wherein DiStefano et al. teach the electrode/pad on the substrate and the bump electrode being electrically connected (Fig. 14-17).

Regarding claim 32, DiStefano et al. and Khandros et al. teach substantially the entire claimed structure as applied to claim 30 above, except the first and second protrusions having an amount of conductive adhesive by which the IC electrode of the semiconductor element can be connected to the bump electrode.

Khandros et al. teach further teach the variety of configurations having respective electrode/pad/terminal interconnections being bonded/coupled using a conductive material such as a solder or a conductive epoxy/adhesive (Col. 21, line 47).

It would have been obvious to a person of ordinary skill in the art at the time invention was made to incorporate the first and second protrusions having an amount of conductive adhesive by which the IC electrode of the semiconductor element can be connected to the bump electrode as taught by Khandros et al. so that the desired package integration and interconnections can be achieved in Khandros et al. and DiStefano et al's arrangement.

Regarding claim 33, DiStefano et al. and Khandros et al. teach substantially the entire claimed structure as applied to claim 25 above, wherein DiStefano et al. teach the flat

portion of the first protrusion and that of the second protrusion having a substantially same height (see the height of protruding portions 80 in Fig. 14).

Regarding claim 34, DiStefano et al. and Khandros et al. teach substantially the entire claimed structure as applied to claim 30 above, except the second protrusion being formed from a portion of the wire extending upward from the wire material portion bonded to the formed portion.

Khandros et al. teach further teach the variety of configurations/shapes of the protrusions/bends in the contact structures where the protrusions/bends (see a variety of protrusions/bends in Fig. 3-11) are formed from a portion of the wire extending in upward direction, downward direction or sideways from the wire material portion.

It would have been obvious to a person of ordinary skill in the art at the time invention was made to incorporate the second protrusion being formed from a portion of the wire extending upward from the wire material portion bonded to the formed portion as taught by Khandros et al. so that the desired configuration/shape and bonding strength can be achieved in Khandros et al. and DiStefano et al's arrangement.

Response to Arguments

7. Applicant's arguments with respect to claims 12, 13 and 21-24 have been considered but are moot in view of the new ground(s) of rejection.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Nitin Parekh whose telephone number is 571-272-1663. The examiner can normally be reached on 09:00AM-05:30PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Eddie Lee can be reached on 571-272-1732. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9318.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is 703-308-0956

Nitin Parekh

NP

11-14-03

NITIN PAREKH

PATENT EXAMINER

TECHNOLOGY CENTER 2800